B.Sc. IIIr^{d} year Physics (Semester-V)
Classical and Quantum Mechanics
Course code PHY-301
Paper-XV

Period-45 **Marks-50**

Chapter 1. Classical Mechanics **[11]**

Mechanics of Particle, Mechanics of system of particles Constraints, Classification of Constraints, Virtual Work, ,D'Alembert's principle, Lagrange's equation, Simple application of Lagrangian formulation –Simple Pendulum, Particle in space, Linear Harmonic Oscillator, Atwood's Machine .

Chapter 2. Origin of Quantum theory **[12]**

Introduction, Failure of Classical mechanics, Black body Radiation (Distribution of Energy), , Plank's Quantum theory-Plank's Quantum postulates, linear momentum of photon in terms of wave vector, Plank's radiation law-Wein's law and Rayleigh's law, Einstein's equation: Quantum theory of photoelectric effect, Quantum effect.

Chapter 3. Wave Particle duality **[12]**

Introduction, de-Broglie's hypothesis for matter waves, de-Broglie's wavelength in terms of energy and temperature, de-Broglie phase velocity and particle velocity (relation between them), Group velocity, Relation between group velocity and phase velocity, ,Davisson-Germer Experiment, Heisenberg uncertainty principle, Applications of Heisenberg uncertainty principle (1) Nonexistence of electrons in nucleus (2) Binding energy of an electron in an atom.

Chapter 4. The Schrodinger Equation and its applications **[10]**

Wave Function (Ψ) of a moving particle, Time dependent Schrodinger's wave equation, Expectation value, Operators, , Time independent Schrodinger equation (steady state form), particle in one dimensional box, Quantization of energy and momentum.

Reference Books

1) Classical Mechanics- H- Goldstein
2) Classical Mechanics – N.C. Rana and P.S. Joag
3) Classical Mechanics – Gupta, Kumar and Sharma
4) Introduction of Classical Mechanics – R.G. Takwale& P.S. Puranik.
5) Physics for degree student – C.L. Arora, P.S. Hemne (Ist edition S. Chand Publication).
6) Quantum Chemistry- Donald Allan Macquarie (Viva-Books Pvt. Ltd.).
7) Mathematics for Chemistry- Donald Allan Macquarie (Viva Books Pvt. Ltd.).
8) Concepts of Modern Physics - Arthur Beiser, ShobhitMahajan, S. RaiChoudhary (VIth Edition- Mc- Graw Hill).
9) Perspective of Modern Physics – Arthur Beiser.

B.Sc. IIIrd year Physics (Semester-V)

Electrodynamics

Course code PHY-302

Paper-XVI

Period-45 **Marks-50**

Chapter 1. Electrostatics **[12]**

Introduction : Electric field lines , electric flux and Gauss law, the divergence of E, Curl of E, Application of Gauss law: i) Electric field due to a uniform charged sphere ii) Electric field due to charged cylinder, Gaussian pillbox, Poisson's equation, Laplace's equation, Uniqueness theorem (First and Second)

Chapter 2. Time varying field **[10]**

Faraday's Law of Electromagnetic induction, Lenz's law, Self-Induction, Mutual Induction, equation of continuity, Maxwell's displacement current, Maxwell's equation (Derivation, Differential form)

Chapter 3. Electromagnetic waves III **[15]**

Origin of electromagnetic waves, characteristics of electromagnetic wave, electromagnetic wave equations in a conducting medium, transverse nature of electromagnetic wave, plane polarized electromagnetic wave, The Poynting Vector, Poynting theorem, Polarization of Electromagnetic waves

Chapter 4. Interaction of Electromagnetic waves with matter **[08]**

Boundary condition for the electromagnetic field vector **–B,E,D and H** at the interface between the two media, reflection and refraction at the boundary of two non conducting media.

Reference Books:

1. Introduction to Electrodynamics-David J. Griffiths, Third Edition.
2. Mechanics and Electrodynamics - Brijlal N. Subrahmanyam, JivanSeshan
3. Classical Electrodynamics – S.P. Pure
4. Electrodynamics- B.B. Laud
5. Electrodynamics-Gupta, Kumar and Singh, Pragati Prakashan, Meerut
6. Electromagnetic waves and fields –R.N.Singh

B.Sc. IIIrd year Physics (Semester-VI)

Practical

Course code PHY-307

Paper-XVII

Marks-50

List of experiments

1. Thermal conductivity by Forb's method
2. Rydberg constant
3. B-H curve using magnetometer
4. Determination of Debye's temperature (e.g. Tin)
5. Determination of dielectric constant of liquid/solid
6. Resistance measurement of semiconductor by Vaders Pau's method
7. I-H Curve by Excel
8. Rydberg constant Excel

Note:- At least Six experiments should be performed.

B.Sc. IIIrd year Physics (Semester-VI)

Practical

Course code PHY-308

Paper-XVIII

Marks-50

List of experiments

1. Temperature coefficient of resistance of semiconductor
2. Measurement of thickness of thin film by gravimeter/optical/electrical method
3. Temperature of sodium flame
4. Hartmann's dispersion formula
5. Maxwell's bridge (measurement of inductance using impedance at different frequency)
6. λ by grating (normal incidence)
7. Transistorized Regulated power supply using Zener diode.
8. Bridge Rectifier

Note:- At least Six experiments should be performed.

B.Sc. III[rd] year Physics (Semester-VI)
Atomic, Molecular Physics and LASER
Course code PHY-305
Paper-XIX

Period-45 **Marks-50**

Chapter 1. The Atom model **[10]**

Introduction, Thomson atom model, the Rutherford nuclear atom model, drawbacks of Rutherford atomic model, the Bohr's atom model, Bohr's theory of origin of spectral lines, diagrammatic representation of the series spectrum of the H-atom in the light of Bohr's theory.

Chapter 2. Vector Atom Model **[15]**

Introduction-vector atom model, Quantum numbers associated with the vector atom model, L-S coupling, j-j coupling, The Pauli's exclusion principle, Selection rules, Intensity Rules, Interval Rule, Normal Zeeman effect, Anomalous Zeeman effect, Stark effect and its experimental study.

Chapter 3. Molecular spectra **[15]**

Introduction, origin of pure rotational spectrum of a molecule, origin of vibration-rotation spectrum of a molecule, Rayleigh's law of scattering, Raman effect-Discovery, experimental study, Applications of Raman effect-molecular structure, Nature of liquids, Crystal Physics, Nuclear Physics, Chemical effects.

Chapter 4. LASER **[10]**

Introduction, induced absorption, spontaneous emission, stimulated emission, population inversion, properties of laser beam, laser pumping, Types of laser-Ruby laser, He-Ne laser, carbon dioxide (CO_2) laser, Applications of laser-Biological, medical and industrial.

Reference Books

1. Atomic Physics – J.B. Rajam, S. Chand & Company Ltd.
2. Physics for degree students – C.L. Arora, Dr. P.S. Hemne, S. Chand Publication
3. Modern Physics – R. Murugeshan, Er. KiruthigaSivaprasath, S. Chand Publication
4. Introduction of Atomic Spectra-white.
5. Fundamentals of Molecular Spectroscopy- C.N. Banwell and E.M. McCash (McGraw Hill International Edition)

B.Sc. IIIr^{d} year Physics (Semester-VI)
Non-conventional energy sources and Optical fiber
Course code PHY-306
Paper-XX

Period-45 **Marks-50**

Chapter1. Non-conventional energy sources **(12)**

Introduction, Biomass, wind energy, tidal energy/Ocean energy, geothermal energy, biogas hydro energy, wind energy, solar energy

Biogas plant-fixed dome type

Wind energy: Introduction to wind energy, terms and definition: wind, wind farm, wind turbine, vertical axis wind turbine (VAWT), horizontal axis wind turbine (HAWT), propeller (wheel), wind mill,types of wind turbines generator units, monoblade HAWT, twin blade HAWT, merits and limitation of wind energy.

Chapter 2. Solar Photovoltaic Systems: **(10)**

Introduction to photovoltaic systems, Solar Cell fundamentals: i) Semiconductor, ii) P-N junction, iii) Generation of electron-hole pair by photon absorption, iv) I_V characteristics of solar cell

Electrical storage: Lead acid battery, basic battery theory

Chapter 3. Introduction of optical fiber **(10)**

Introduction, importance of optical fiber, classification of optical fiber- stepped index fiber, stepped index monomode fiber, Disadvantages of monomode fiber, plastic fiber, latest developed types of optical fibers- HPSUV; HPSIR; Halide; Tapered.

Chapter4. Fiber cables and fabrication **(13)**

Fiber fabrication: Classification of fiber fabrication techniques; external chemical vapour deposition (external CVD), axial vapour deposition (AVD), internal chemical vapour deposition (internal CVD)

Fiber Cables: Construction, Strength members, cable tensile loading, minimum bend radius losses incurred during installation of cables or during subscriber service testing of cable, selection criteria, optical cable fiber laying in telephone.

References:

1) Optoelectronics; R. A. Barapate (Tech-Max Publication, Pune)
2) Principles of Solar Cells, LEDs and Diodes: The role of the PN junction; ADRIAN KITAI (2011 John Wiley & Sons, Ltd)
3) Light Sources: Technologies and Applications; Spiros Kitsinelis (CRC Press Taylo & Francis Group, FL 33487-2742) - 2011
4) Energy technology (non-conventional, renewable, and conventional) - S. Rao, Dr. B.B. Parulekar, Khanna Publishers.
5) Non-conventional energy resources- B.H. Khan, G.D. Rai, R.P. Khare, IInd edition, McGraw Hill Education (India) Private Limited, New Delhi.
6) Non-conventional Energy Sources- G.D. Rai, Khanna Publisher
7) Solar energy and Rural development- S.H. Pawar, C.D. Lokhande& R.N. Patil
8) Solar energy, Fundamentals and applications- Garg, Prakash Tata McGraw Hill
9) Fiber Optics and Optoelectronics – R.P. Khare, Oxford University Press.

B.Sc. IIIr[d] year Physics (Semester-V)

Practical

Course code PHY-303

Paper-XXI

Period-45 **Marks-50**

List of experiments

1. Measurement of the focal length of a given convex lens using laser
2. Spectral response of photoconductor (LDR)
3. Diffraction of grating using laser beam
4. e by Millikan's oil drop method
5. Study of thermocouple (Fe-Cu) and to find inversion temperature
6. Refractive Index R.I. of Optical fiber
7. constant of B.G. by standard condenser method
8. study of absorption spectra of iodine and determination of its wavelength using grating

Note :- At least Six experiments should be performed.

B.Sc. III[rd] year Physics (Semester-V)

Practical

Course code PHY-304

Paper-XXII

Marks-50

List of experiments

1. Beam divergence of a diode laser
2. Determination of the diameter of a thin wire using laser
3. To study the interference of light using optical fibers
4. Determination of wavelength of He-Ne laser by transmission grating and reflection grating
5. Y by Koenig's method
6. Edser's A pattern
7. e/m by Thomson methods by Excel
8. Surface tension by Ripple's method

Note :- At least Six experiments should be performed.